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5-16-06

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ANIMAL INDUSTRY.—CIRCULAR NO. 95.

A. D. MELVIN, CHIEF OF BUREAU.

WASHINGTON, D. C., May 14, 1906.

The following article presents the results of a careful study by Mr. George M. Rommel, animal husbandman of this Bureau, of the pedigree records for Poland China and Duroc Jersey hogs to determine the fecundity of the sows and whether any decrease in this characteristic can be noted. Only records certified by the Secretary of Agriculture were used.

The investigation of this subject has involved an immense amount of tedious work by the author and his assistants. Acknowledgment is made to the Bureau of Statistics for assistance in preparing the data concerning the Duroc Jerseys, and to Prof. W. M. Hays, Assistant Secretary of Agriculture, to Mr. W. M. McFadden, secretary of the American Poland China Record Company, and to Mr. Robert J. Evans, secretary of the National Duroc Jersey Record Association, for valuable suggestions and assistance.

A. D. MELVIN,
Chief of Bureau.

THE FECUNDITY OF POLAND CHINA AND DUROC JERSEY SOWS.

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INTRODUCTION.

There is little reason to doubt that the subject of animal breeding is on the threshold of great changes. Scientists have been studying the laws of heredity in plants with great earnestness and with great results during the last thirty years, and practical plant growers have not been slow to follow them, with the result that tremendous strides have been made. On the other hand, it is not an exaggeration to say that in animal breeding the methods used by practical breeders are at present very little, if any, different from those of Bakewell, and with the exception of the work of a handful of investigators, nothing of a scientific nature has been done in animal breeding since Darwin. This statement may not be exactly fair, as there is good reason for this condition of affairs. Although the first attempts show quick results, improvement in animal breeding is made slowly in the long run, and when once lost is not readily regained. A breeder of animals who

has accomplished results of merit is loath to experiment with new methods and rightfully prefers to contend with problems with which he is more or less familiar rather than to attack those which are unknown and whose results may be disastrous. Animal breeders have good reason to be conservative.

Some reasons why investigators are few in this field of scientific research are that the expense is much greater than in plant breeding, that animals multiply slowly compared with plants, and that animals, unlike plants, can not be self-fertilized. However, the obstacles in the path will be surmounted eventually. Hogs, sheep, goats, poultry, and the highly prolific animals below the vertebrates can be used in this work to good advantage. Some scientists have suggested fishes as promising subjects, and good work has been done with insects and even lower animals.

One of the most available sources of information is found in the pedigree records for the various breeds of domestic animals, yet it has hardly been touched. These records have been used almost entirely for recording the descent of animals, but some of them cover periods of more than one hundred years, and they are of far more importance from the standpoint of the student of heredity than any human genealogies on account of the large numbers of individuals and the higher rate of multiplication. Without going into detail, their value can be appreciated by remembering that Francis Galton established his Law of Ancestral Heredity from the record of the breeding of Basset hounds in England, and that the same investigator and others obtained good results on the inheritance of coat color in Thoroughbred horses from the data in the General Studbook. Redfield's work with American trotting horses is also a notable instance of this kind.

No country has more extensive pedigree records for domestic animals than the United States. Every breed of any prominence has its book of record of pedigrees. These records will well repay study, and the results thus obtained can profitably be applied to practical breeding conditions. The results presented in the following pages were compiled from the mass of data which has been collected in this country by three of the hog-breeders' associations.

PLAN OF THE INVESTIGATION.

The studies which the Bureau has been making concerning the fecundity of sows for the past two years were first planned to include only the Poland China breed for several reasons, but chiefly because of its predominance over others in the United States, because charges have been made for years that the sows of that breed have been decreasing in fecundity, and because the Bureau was urged to begin experiments looking to the increase of the fecundity of the breed, in which case it was highly important to know whether there had been

an increase. As the work progressed a comparison with the Duroc Jersey breed seemed desirable, and it was included so far as the work of the pedigree-record associations made this possible.

As the American Poland China Record is much the largest of the hog-pedigree records, it was first selected, but the results shown by a study of this record were so surprising that the Ohio Poland China Record (now the National), the oldest for this breed, was taken up to see whether the results with the American record would be confirmed. It was out of the question to compile the fecundity reports for all years since the foundation of these records. Therefore the results for the years 1898 to 1902 were compared with those for 1882 to 1886, the latter being the earliest of the American record for which comprehensive data were available. In the earlier period there was an average of 1,231 litters per year for the American record and 1,710 for the Ohio. In the later period the American average was 5,901 litters per year and the Ohio 2,060. These numbers are large enough for accurate work. Most students of heredity regard 200 cases as sufficient, and the Bureau is especially fortunate in having much larger numbers. The selection of the years mentioned gives a good basis for comparison and avoids the enormous amount of clerical work which would have been necessary if all the published volumes had been used and results calculated for each year. The results given herewith were taken from volumes 3 to 8, inclusive, and 21 to 36, inclusive, of the American record, and volumes 5 to 9, inclusive, and 20 to 26, inclusive, of the Ohio record. This plan did not include all the litters recorded for the years mentioned, as some of these appear in later volumes, but the volumes used contain the great majority of the litters for these years, and a great many additional ones would be required to affect the final results.

For the Duroc Jersey breed the National Duroc Jersey Record was used. (The American Duroc Jersey Record does not report fecundity.) A small number of litters appear in this record for the years 1888-1892, inclusive, but as the number is quite small these years are inserted for comparison only. The results for this breed are complete so far as the National Duroc Jersey Record goes, volumes 1 to 14 being used, giving litters recorded up to and including 1902. Some 1902 litters are recorded in later volumes, but not enough to affect the final results. A sufficient number of Duroc Jersey litter records are available to make an accurate comparison of the fecundity of sows of this breed with those of the Poland China, but the record has not been established for a sufficiently long time to show much as to increase or decrease in fecundity.

It is unfortunate that the American Berkshire Association does not require fecundity reports from its breeders. As it is, the Berkshire breed can not be compared with the others. The Standard Poland

China Record was omitted because it was not started until some years after the others, and the results for the later years would hardly have had a sufficient effect on the general results to warrant the additional work required. The Ohio Improved Chester Record does not report fecundity.

The reader may be interested in knowing the system that was used, and may then better appreciate the amount of work required to insure accurate results.

As is well known, the Poland China records generally publish the registration of hogs according to the following plan or modifications of it:

MAGNET'S MODEL 2D, 135786.

Farrowed March 28, 1902. Litter, 7; raised—boars, 0; sows, 4.

Black with white points.

Bred and owned by W. C. Williams and Gardner, Bryant, Jay County, Ind. Sire: Tecumseh Magnet, 46925; he by Nelson's Magnet, 35535, and out of Miss Rosa, 75542.

Dam: Gardner's Model, 122578, by Invincible Chief, 43377, etc.

This is the registration of a sow on page 282 of volume 26 of the Ohio Poland China Record.

For each hog registered a card (size about 2 by 4 $\frac{1}{8}$ inches) was written according to the following plan:

Name and number of dam.

Date progeny was farrowed. Number of pigs in litter; boars raised, sows raised; total raised.

Volume and page reference.

The above litter would therefore appear on its card as follows:

Gardner's Model, 122578.

March 28, 1902.

7 — 0 — 4. 4

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In the National Duroc Jersey Record pedigrees are published in tabulated form with practically the same information. The cards for this record were written in the same way as those for the Poland China records, except that the name and number of the sire of the litter were written at the bottom of the card. Instead of a page reference the number of the hog from whose registration data were taken was used.

After all the cards for a volume were written, two clerks compared them with the originals and corrected errors in copying, one reading the original records while the other corrected the copies. After all the cards for a breed were written and verified they were sorted according to years; next the cards for each year were sorted according to size of litter farrowed; next the cards for each size of litter were arranged numerically according to the numbers of dams and duplicates thrown out, and finally the cards were counted and averages calculated. Cards were counted at least twice by different persons, and the calculations were made twice by different persons. In writing the cards for the American Poland China Record from 1898 to 1902 the page reference was not included, which we now know was a mistake, as it is almost impossible to find a litter record without a page reference. The cards for the American Poland China Record were arranged alphabetically at first, and it was necessary to rearrange them numerically, which eliminated a large number of duplicates.

All corrections made in the volumes published by the associations were carefully noted. Typographical errors were eliminated as far as possible. Where a palpable error could not be corrected, the litter was not counted.

The reader will recognize the fact that the probability of error in this work is large. Breeders are not always careful in reporting the number of pigs farrowed, often relying on the memory. In spite of the painstaking care of secretaries, errors in copying and typographical errors are sure to occur, and in our own work errors in copying, indexing, and counting were probable, although the cards were handled many times. At the same time, although the probability of error is large, the probability of these errors affecting the final results is very small on account of the large numbers used. A mistake of one hundred litters for one of the later years of the American Poland China Record would affect the average for that year slightly, but would have no serious effect on the five-year average. The writer believes that the factor of error in these calculations has been reduced below the point of practical importance.

POLAND CHINA SOWS.

AMERICAN POLAND CHINA RECORD.

The earliest year in which a large number of litters are found is 1882.

The table following shows litters farrowed, with number of pigs and averages for each year, from 1882 to 1886, inclusive.

TABLE I.—*Fecundity of Poland China sows as shown by American Poland China Record, litters farrowed from 1882 to 1886, inclusive.*

Size of litters.	1882.		1883.		1884.		1885.		1886.	
	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.
1.....	1	1	5	5	4	4	9	9	3	3
2.....	20	40	25	50	21	42	21	42	12	24
3.....	21	63	34	102	63	189	40	120	25	75
4.....	35	140	86	344	98	392	104	416	68	272
5.....	100	500	150	750	196	980	200	1,000	126	630
6.....	144	864	219	1,314	296	1,776	287	1,722	172	1,032
7.....	161	1,148	288	1,981	320	2,240	296	2,072	194	1,358
8.....	165	1,320	217	1,736	300	2,400	245	1,960	179	1,432
9.....	92	828	152	1,368	156	1,404	172	1,548	106	954
10.....	40	400	57	570	70	700	86	860	52	520
11.....	20	220	31	341	39	429	32	352	26	286
12.....	8	96	8	96	12	144	18	216	6	72
13.....	2	26	3	39	2	26	4	52	4	52
14.....	1	14	.....	.....	1	14	1	14	1	14
15.....	2	30	1	15	.....	.....	.....	.....	1	15
Total.....	815	5,690	1,271	8,711	1,578	10,740	1,515	10,383	975	6,789
Average		6.98	.....	6.85	.....	6.81	.....	6.85	.....	6.91

The yearly average size of litters shown in the foregoing table varies from 6.81 to 6.98, the average for the five years being 6.87.

The yearly averages in this and succeeding tables were obtained by dividing the total number of pigs farrowed in any year by the total number of litters for that year. Five-year averages were obtained in the same manner, using the totals for the five-year periods.

The following table shows litters recorded in the American Poland China Record which were farrowed from 1898 to 1902, inclusive, with number of pigs and averages for each year:

TABLE II.—*Fecundity of Poland China sows as shown by American Poland China Record, litters farrowed from 1898 to 1902, inclusive.*

Size of litters.	1898.		1899.		1900.		1901.		1902.	
	Number of litters.	Number of pigs.								
1.....	6	6	4	4	2	2	2	2	9	9
2.....	40	80	30	60	38	76	30	60	42	84
3.....	57	171	104	312	86	258	98	294	100	800
4.....	269	1,076	243	972	262	1,048	247	988	288	1,152
5.....	468	2,340	536	2,680	565	2,825	522	2,610	630	3,150
6.....	758	4,548	850	5,100	928	5,588	984	5,904	1,075	6,450
7.....	993	6,951	1,100	7,700	1,122	7,854	1,205	8,435	1,336	9,352
8.....	917	7,836	1,069	8,552	1,207	9,656	1,217	9,736	1,284	9,872
9.....	660	5,940	742	6,678	868	7,812	967	8,703	927	8,343
10.....	446	4,460	470	4,700	525	5,250	588	5,830	559	5,590
11.....	234	2,574	209	2,299	276	3,036	294	3,234	267	2,937
12.....	83	996	91	1,092	113	1,356	126	1,512	86	1,032
13.....	39	507	39	507	37	481	51	663	44	572
14.....	12	168	9	126	16	224	20	280	22	308
15.....	1	15	1	15	1	15	3	45	6	90
16.....	2	32	3	48	.....	.....	2	32	1	16
17.....	.....	.....	1	19	.....	.....	1	17	1	17
18.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19.....	.....	.....	1	19	.....	.....	.....	.....	.....	.....
Total.....	4,985	37,200	5,501	40,864	6,041	45,481	6,352	48,345	6,627	49,274
Average		7.46	.....	7.43	.....	7.52	.....	7.61	.....	7.44

The yearly average size of litters shown in the foregoing table varies from 7.43 to 7.61, the average for the five years being 7.49.

The following table shows the averages for the years covered in Tables I and II for each year and for the five-year periods:

TABLE III.—*Average sizes of litters of Poland China sows, American Poland China Record, 1882–1886 and 1898–1902.*

Year.	Average size of litters.	Year.	Average size of litters.
1882	6.98	1898	7.46
1883	6.85	1899	7.43
1884	6.81	1900	7.52
1885	6.85	1901	7.61
1886	6.91	1902	7.44
Five years	6.87	Five years	7.49

This table shows that for the years and litters included in these calculations there has been an increase in fecundity among sows registered in the American Poland China Record of 0.62 per litter.

OHIO POLAND CHINA RECORD.

In the work on the Ohio record every precaution was taken to avoid duplicating the records of the American. Litters recorded in the latter were not counted. The information given regarding the Ohio record is therefore additional to that of the American. As this work began with the American Poland China Record, the earliest year for that record, 1882, was taken as the starting point with the Ohio record for the sake of uniformity, although Ohio results could be presented for about five years before this time.

The following table shows the litters recorded in the Ohio Poland China Record, farrowed from 1882 to 1886, inclusive:

TABLE IV.—*Fecundity of Poland China sows as shown by Ohio Poland China Record, litters farrowed from 1882 to 1886, inclusive.*

Size of litters.	1882.		1883.		1884.		1885.		1886.	
	Number of litters.	Number of pigs.								
1	3	3	7	7	3	3	2	2	.....	.....
2	9	18	23	46	10	20	14	28	10	20
3	37	111	43	129	50	150	39	117	42	126
4	80	320	130	520	101	404	117	468	87	348
5	152	760	180	900	247	1,235	232	1,160	203	1,015
6	242	1,452	295	1,770	336	2,016	316	1,896	291	1,746
7	298	2,051	317	2,219	399	2,793	377	2,639	330	2,310
8	227	1,816	268	2,144	313	2,504	346	2,768	321	2,568
9	142	1,278	183	1,647	219	1,971	222	1,998	198	1,782
10	52	520	121	1,210	100	1,000	148	1,480	109	1,090
11	31	341	38	418	67	737	89	979	75	825
12	10	120	26	312	33	396	35	420	47	564
13	8	104	18	234	13	169	14	182	21	273
14	3	42	7	98	8	112	6	84	5	70
15	2	30	.....	.....	2	30	3	45	.....	.....
16	.....	.....	.....	.....	1	16	1	16	.....	.....
Total.....	1,291	8,966	1,656	11,654	1,902	13,556	1,961	14,282	1,739	12,787
Average .....	.....	6.95	.....	7.04	.....	7.13	.....	7.28	.....	7.82

The average size of litters shown in the above table varies from 6.95 to 7.32, the average for the five years being 7.16.

The following table shows the litters recorded in the Ohio Poland China Record, farrowed from 1898 to 1902, inclusive:

TABLE V.—*Fecundity of Poland China sows as shown by Ohio Poland China Record, litters farrowed from 1898 to 1902, inclusive.*

Size of litters.	1898.		1899.		1900.		1901.		1902.	
	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.
1.....	1	1	1	1	1	1	1	1	1	1
2.....	14	28	13	26	14	28	7	14	11	22
3.....	32	96	33	99	35	105	39	117	36	108
4.....	69	276	83	332	72	288	80	320	94	376
5.....	158	790	166	880	186	930	181	905	144	720
6.....	300	1,800	319	1,914	313	1,878	301	1,806	318	1,908
7.....	371	2,597	420	2,940	424	2,968	352	2,464	401	2,807
8.....	405	3,240	406	3,248	454	3,632	401	3,208	422	3,376
9.....	291	2,619	305	2,745	306	2,754	327	2,943	276	2,484
10.....	180	1,800	197	1,970	190	1,900	189	1,890	193	1,930
11.....	78	858	86	946	105	1,155	98	1,078	89	979
12.....	32	384	41	492	48	576	45	540	38	466
13.....	12	156	22	286	20	260	14	182	15	195
14.....	4	56	3	42	6	84	3	42	7	98
15.....	.....	.....	1	15	2	30	.....	.....	1	15
16.....	.....	.....	.....	.....	1	16	1	16	.....	.....
17.....	1	17	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	1,948	14,718	2,096	15,886	2,177	16,605	2,039	15,526	2,046	15,475
Average.....		7.56		7.58		7.63		7.61		7.56

The average size of litters shown in the above table varies from 7.56 to 7.63, the average for the five years being 7.59.

The following table shows the averages for the years covered by Tables IV and V for each year and for the five-year periods.

TABLE VI.—*Average sizes of litters of Poland China sows, Ohio Poland China Record, 1882–1886 and 1898–1902.*

Year.	Average size of litters.	Year.	Average size of litters.
1882.....	6.95	1898.....	7.56
1883.....	7.04	1899.....	7.58
1884.....	7.13	1900.....	7.63
1885.....	7.28	1901.....	7.61
1886.....	7.32	1902.....	7.56
Five years.....	7.16	Five years.....	7.59

The average size of litters included in these calculations for sows registered in the Ohio Poland China Record shows an increase in fecundity of 0.43 per litter from 1882 to 1902. This is 0.16 per litter less than that of the American record, but is nevertheless a substantial increase.

If the litters recorded in both these records are combined, and averages calculated as above, the results obtained can justly be regarded as representative of the breed as a whole, what is true for these records being undoubtedly true for other records for the breed. This

has been done, and the following table shows the averages for the breed for the American and Ohio records combined.

TABLE VII.—*Fecundity of Poland China sows as shown by American and Ohio Poland China records combined, 1882–1886 and 1898–1902.*

Year.	Number of litters.	Number of pigs.	Average size of litters.	Year.	Number of litters.	Number of pigs.	Average size of litters.
1882	2,106	14,656	6.96	1898	6,988	51,918	7.49
1883	2,927	20,365	6.96	1899	7,597	56,750	7.47
1884	3,480	24,296	6.98	1900	8,218	62,036	7.55
1885	3,476	24,665	7.10	1901	8,391	68,871	7.61
1886	2,714	19,476	7.18	1902	8,673	64,749	7.47
Five years ...	14,703	103,458	7.04	Five years ...	39,812	299,324	7.52

In combining the results for both records, the larger number of the Ohio litters in the earlier years offsets the low average of the American and in the later years the preponderance of the American litters lowers the average of the Ohio. In spite of this, an undoubted increase is evident, and the conclusion is inevitable that, contrary to popular opinion, the sows of the Poland China breed have increased in fecundity during the last twenty years. The increase shown above—0.48 per litter—is not extraordinary, but the numbers are large enough to indicate an increase in the fecundity of the breed as a whole. What was true of 14,000 litters twenty years ago was probably true of the entire breed, and what is true for 39,000 litters to-day is no less probably true for the entire breed. An increase of only 0.48 per litter in twenty years would not mean much, perhaps, to the man who was raising hogs for the butcher's trade; but these are animals intended for breeding purposes and sold at a great advance over butcher's prices, and therefore this increase represents a very substantial addition to the value of the breed. It is not possible to state what proportion of the litters observed in this work was farrowed by fashionably bred Poland China sows, against which the charge of diminishing fecundity is particularly directed; but as the pigs from such sows seldom, if ever, fail to be recorded in either the American or the Ohio record, the litters of fashionable sows are undoubtedly included in these calculations and have their influence on the general result. The most important point in these results is that the fecundity of the breed is not being lost, but, on the contrary, is increasing.

DUROC JERSEY SOWS.

NATIONAL DUROC JERSEY RECORD.

For reasons already stated, the first year in the National Duroc Jersey Record of much value for our purpose is 1893. However, for information and for comparison only, the results for the years 1888 to 1892, inclusive, are given below.

TABLE VIII.—*Fecundity of Duroc Jersey sows as shown by National Duroc Jersey Record, litters farrowed from 1888 to 1892, inclusive.*

Size of litters.	1888.		1889.		1890.		1891.		1892.	
	Number of litters.	Number of pigs.								
1.....										
2.....									1	2
3.....			1	3	3	9	2	6	2	6
4.....			1	4	2	8	4	16	4	16
5.....			1	5	1	5	4	20	5	25
6.....	2	12			2	12	10	60	17	102
7.....	2	14	1	7	7	49	17	119	22	154
8.....	1	8	7	56	9	72	22	176	36	288
9.....			4	36	12	108	21	189	27	243
10.....	1	10	3	30	7	70	17	170	28	280
11.....			1	11	8	88	8	88	16	176
12.....			3	36	4	48	7	84	11	132
13.....					1	13	1	13	11	143
14.....			1	14	2	28	2	28	1	14
15.....			1	15					2	30
16.....			1	16					1	16
17.....			2	34						
18.....							1	18		
19.....										
20.....					1	20				
Total.....	6	44	28	287	58	510	116	987	184	1,627
Average		7.33		10.25		8.79		8.51		8.84

The averages shown in this table are low, except for 1889, but the number of litters is so small that the results can not be regarded as comprehensive, especially when taken into consideration with later years. The average for the five years, 1888 to 1892, is 9.04. For some reason which it is not possible to explain, the average size of litter increases suddenly with the year 1894, shown in Table IX. However, the writer vouches for these figures as being correct, as shown by the National Duroc Jersey Record, but can not, of course, go back of that record.

The following table shows the litters farrowed, with number of pigs, totals, and averages for each year from 1893 to 1897, inclusive.

TABLE IX.—*Fecundity of Duroc Jersey sows as shown by National Duroc Jersey Record, litters farrowed from 1893 to 1897, inclusive.*

Size of litters.	1893.		1894.		1895.		1896.		1897.	
	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.
1.....					2	4	1	2	7	14
2.....					2	6	3	9	7	21
3.....	4	12	2	6	2	6	19	76	23	92
4.....	4	16	9	36	8	82	31	155	35	175
5.....	22	110	14	70	25	125	67	402	91	546
6.....	24	144	19	114	42	252	104	728	150	1,050
7.....	34	238	41	287	63	441	150	1,200	203	1,624
8.....	65	520	100	800	107	856	132	1,188	230	2,070
9.....	53	477	104	936	120	1,080	153	1,530	208	2,080
10.....	43	430	78	780	125	1,250	93	1,023	152	1,672
11.....	34	374	45	495	74	814	94	1,128	122	1,464
12.....	8	96	42	504	47	564	559	47	611	
13.....	9	117	15	195	30	390	43	36	4	
14.....	6	84	13	182	26	364	24	336	33	462
15.....	1	15	9	135	7	105	12	180	14	210
16.....	1	16	5	80	4	64	8	48	9	144
17.....			2	34	1	17	1	17	4	68
18.....					1	18	2	36	4	72
19.....									1	
20.....									20	
Total.....	308	2,649	498	4,654	684	6,382	932	8,617	1,340	12,895
Average		8.60		9.35		9.33		9.25		9.25

The average size of litters for the years 1893 to 1897 for the Duroc Jersey breed, as shown by the litters used in these calculations, varies from 8.60 in 1893 to 9.35 in 1894, other years averaging between 9.25 and 9.33.

The following table shows the litters taken from the National Duroc Jersey Record for the years 1898 to 1902, inclusive:

TABLE X.—*Fecundity of Duroc Jersey sows as shown by National Duroc Jersey Record, litters farrowed from 1898 to 1902, inclusive.*

Size of litters.	1898.		1899.		1900.		1901.		1902.	
	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.	Number of litters.	Number of pigs.
1.....	5	10	4	4	11	22	3	3	4	4
2.....	7	21	13	39	26	78	18	36	8	16
3.....	29	116	37	148	47	188	75	66	46	138
4.....	62	310	72	360	113	565	132	300	73	292
5.....	99	594	148	888	231	1,386	291	1,746	347	970
6.....	161	1,127	235	1,645	371	2,597	455	3,185	627	2,082
7.....	303	2,424	382	3,056	537	4,296	702	5,616	952	7,616
8.....	283	2,547	399	3,591	525	4,725	713	6,417	1,053	9,477
9.....	277	2,770	361	3,610	519	5,190	716	7,160	1,000	10,000
10.....	200	2,200	273	3,003	381	4,191	492	5,412	718	7,898
11.....	144	1,728	181	2,172	273	3,276	347	4,164	502	6,024
12.....	81	1,058	109	1,417	160	2,080	228	2,964	282	3,666
13.....	36	504	44	616	96	1,344	124	1,736	171	2,394
14.....	18	270	21	315	32	480	49	735	73	1,095
15.....	8	128	15	240	17	272	27	432	37	592
16.....	2	34	3	51	7	119	10	170	13	221
17.....	1	18	1	18	2	36	4	72	4	72
18.....					2	38	2	38	5	96
Total	1,716	15,854	2,305	21,187	3,350	30,888	4,410	40,912	6,109	57,041
Average.....		9.24		9.19		9.22		9.27		9.34

The average size of litters shown in the above table varies from 9.19 in 1899 to 9.34 in 1902, other years ranging from 9.22 to 9.27.

The following table shows the average for each year given in Tables IX and X, above, and for the two five-year periods. It is not so valuable as the similar tables for the Poland China breed, both on account of the smaller time covered and on account of the small number of litters in the earlier years, especially in 1893, when only 308 litters were noted with an abnormally low average.

TABLE XI.—*Average sizes of litters of Duroc Jersey sows, National Duroc Jersey Record, 1893-1897 and 1898-1902.*

Year.	Number of litters.	Number of pigs.	Average size of litters.	Year.	Number of litters.	Number of pigs.	Average size of litters.
1893.....	308	2,649	8.60	1898.....	1,716	15,854	9.24
1894.....	498	4,654	9.35	1899.....	2,305	21,187	9.19
1895.....	684	6,382	9.33	1900.....	3,350	30,888	9.22
1896.....	932	8,617	9.25	1901.....	4,410	40,912	9.27
1897.....	1,340	12,395	9.25	1902.....	6,109	57,041	9.34
Five years....	3,762	34,697	9.22	Five years...	17,890	165,877	9.27

It is hardly reasonable that the fecundity of the breed should have so large an increase in one year as is indicated here from 1893 to 1894.

and the same remarks are pertinent for the year 1893 as for the preceding five years. Including the year 1893, the average for the five-year period, 1893 to 1897, is 9.22. Without it, the average for the four years, 1894 to 1897, is 9.28. The average for the five-year period, 1898 to 1902, is 9.27, a slight increase (0.05 per litter) over the preceding five-year period if we include the year 1893, and a slight decrease (0.01 per litter) without that year. These differences are too small to have any practical importance.

Although these figures have little, if any, value as showing the increase or decrease in the fecundity of Duroc Jersey sows, they are valuable as giving a correct idea of the fecundity of the breed as a whole. The numbers are large enough to be representative, so that we may safely regard the results obtained from this record as being representative of the breed. For the ten years, 1893 to 1902, a total of 21,652 litters was considered, with a total number of pigs of 200,574, the average size of litters being 9.26.^a

Compared with those for the Poland China breed, these results confirm common observation—that Duroc Jersey sows are more prolific than Poland Chinas. The combined results of the American and Ohio Poland China records for 1898 to 1902, inclusive, shown in Table VII, can be assumed as representing very close to the average for the entire breed at present. This period shows an average size of litters of 7.52 for Poland China sows.

FURTHER INVESTIGATIONS DESIRABLE.

These studies are of a preliminary character. They will be followed with investigations of the inheritance of fecundity, which can readily be made with the data now at command. As the fecundity of sows is of such importance to the breeder, it is also important to know how far fecundity is inherited, and to what extent, if any, the fecundity of a herd can be increased by the use of animals which are high in this characteristic.

Approved.

JAMES WILSON,
Secretary of Agriculture.

^aWithout the year 1893 the totals for nine years are 21,344 litters, 197,925 pigs, and an average size of litters of 9.27.